Traceable: what does it really mean?

Peter J. Jenks

the Jenks Partnership, Newhaven House, Junction Road, Alderbury, Wiltshire SP5 3AZ, UK. E-mail: jenkspj@aol.com.

The idea that calibration materials should be traceable seems to have become generally accepted over the last few years. This is a positive development that has the potential to improve both analytical quality and the mutual recognition of results.

So why is traceability so very important? Professor Andrew Wallard, Director Designate of the International Bureau of Weights and Measures (BIPM), writing in the latest edition of the EU Measurement & Testing Newsletter, puts it very clearly. He writes:[1]

"In recent years bodies like the World Trade Organisation (WTO) have become concerned about the possible lack of world wide acceptance of test calibration and measurement certificates from National Metrology Institutes (NMIs) as a technical barrier to trade. The International Committee for Weights and Measures (CIPM) has therefore concluded a Mutual Recognition Agreement (MRA) between NMIs that will lead to formal recognition of certificates."

So, without proper recognition of certificates issued by recognised laboratories trade will suffer. For there to be mutual recognition everyone has to be able to agree that a determination of analyte "A" made by laboratory "X" is just as valid as the same determination made by laboratory "Z". For this to be accepted one important requirement is that both laboratories must be able to show that the calibration material used is traceable to the same unit.

But traceable to what?

In the USA, the phrase "NIST Traceable" is used by many analysts, almost as if it is some sort of mantra: provided a reference material is "NIST Traceable" then all will be well. The author finds this touching, if somewhat sad. All too often the prospective customer asks for NIST Traceability when NIST do not even produce a SRM of the type in question.

Traceability stems from the definition in ISO Guide 30[2] for a Certified Reference Material.

Certified Reference Material

A reference material, accompanied by a certificate, one or more of whose property values are certified by a procedure which establishes traceability to an accurate realisation of the unit in which the property values are expressed and for which each certified value is accompanied by an uncertainty at a stated level of confidence.

For the analytical chemist the unit mentioned in the definition is the mole. So a traceable reference material will normally be a Certified Reference Material (CRM) in which the analyte in question, let us use a trace element such as Cadmium (Cd), has been sufficiently well analysed so as to allow a the producer to demonstrate traceability to the mole and to state a value with a level of uncertainty.

So what does "NIST Traceable" actually mean? NIST, the US Department of Commerce's National Institute of Standards and Technology, is certainly not an accurate realisation of the mole! But it is one of a number of Legal Metrology Laboratories qualified to establish such traceability. Therefore "NIST Traceable" must mean that a reference material is required that shows traceability to a NIST SRM which, in turn, should demonstrate traceability to the mole, although NIST on their SRM Certificates say very little indeed about traceability.

In the last edition of *Spectroscopy Europe* I outlined the difficulty of making matrix CRMs in a manner that makes commercial sense. I said that for single element CRMs it was possible to produce CRMs on a commercial basis. True, but only because NIST certifies a comprehensive range of "Spectro STMs" which allow a number of US producers to manufacture properly traceable CRMs.

This is fine, but what is to be done in Europe? Importing single element CRMs form the USA is expensive: to start with NIST Spectro SRMs are not cheap, to this must be added the importation cost of hazardous goods: 3% Nitric acid, the matrix used, is classed as a hazardous material.

So there is a need for a European source of a properly traceable single-element CRMs. This has been recognised by the European Commission in their funding of a project to be undertaken by a cooperation between the JRC – IRMM (Belgium), BAM and PTB (Germany) and EMPA (Switzerland) which is to establish a number of ultra-pure elements as elemental standards from which to establish traceability to the mole.[3] But it is clear that it will be some time before any CRMs are available.

The British company, Romil Limited, appears to have stolen a march on this EU-funded project. They have just received their ISO 17025 accreditation from UKAS as a calibration laboratory for the certification of trace element CRMs. To establish traceability to the mole Romil has chosen to pick up a tech-

nique that was pioneered by the Central Analytical Laboratory of ICI plc: the use of highly-purified silver as an elemental reference. It is satisfying to learn that Romil will release, later this year, a full range of trace element certified reference materials with clear traceability to the mole and a statement of uncertainty.

So although Europe will have, by the end of this year, its own range of properly traceable trace element CRMs the question remains about their recognition. In Europe there will be no problem: with UKAS Certification as a Calibration Laboratory, Romil have the authority needed. But in other markets will their new CRMs be considered as the equal of NIST Spectro SRMs? They should be. UKAS' authority is, through their involvement with the ILAC and EA mutual recognition agreements (MRAs), quite clear. CRMs produced by a calibration laboratory that has been accredited to ISO 17025 by UKAS is no more or no less a CRM than one produced by a NMI.

This is where Professor Wallard and his colleagues at the BIPM come in. For the MRA to mean anything it is essential that not only CRMs produced by the European NMIs, but also CRMs produced by any properly accredited calibration laboratory are recognised by other NMIs around the world.

It is interesting that ILAC state, "It is recognised in some economies calibrations performed by verifying authorities appointed under their economies legal metrology frameworks are also accepted. Legal metrology laboratories (Ed: examples include NIST, LGC, IRMM) should also be encouraged by Accreditation Bodies and through their international and regional organisations to seek accreditation to ensure competence and safeguard proper traceability of their measurement and calibration results and to make their competence transparent to third parties."[4]

When all these accreditations are in place the MRA may be considered to stand together with the Convention of the Metre, signed in 1875. Time will tell. But if the NMIs do not become accredited to ISO 17025 their NMI status may become threatened, as other more dynamic and possibly commercial organisations offer products that better match users' quality system accreditation requirements.

References

1. A. Wallard, *Measurement and Testing Newsletter*, **10(1),** 11–13 (2002).

2. *ISO Guide 30*. ISO, Basle, Switzerland (1992).

3. H. Kipphardt, Poster at "Towards and Integrated Infrastructure for Measurements", Warsaw, 17–19 June 2002.

4. Note 3 in *ILAC Policy on Traceability of Measurement Results*, ILAC P10:2002.